

Auditory learning

George Hardy considers the place of auditory learning in mathematics.

In my previous article entitled, *A Creativity Taxonomy*¹, I focused on the creation of activities that would suit students with a preferred learning style that was either Visual or Kinæsthetic. Having worked creatively in the manner described in that article for some time, it became evident to me that Auditory Learning was a comparatively low-profile learning style in my pedagogic repertoire. I strongly suspected that Auditory Learning was naturally embedded in my practice, and resolved to make it a focus.

As with my previous article, my reflections and actions were personal ones, contributing to a case study that was centred on my own classroom practice. I started to examine my lessons for the presence of auditory features by focusing on definition. My preferred descriptors came from a Neuro-Linguistic Programming course I had attended. From this source I found that Auditory Learners² learn through hearing, and:

- learn by listening, remembering what was discussed rather than seen
- speak in rhythmic patterns
- talk to themselves while working
- move their lips and pronounce the words as they read
- enjoy reading aloud and listening
- can repeat back and mimic
- can find writing difficult, are better at telling
- are frequently eloquent speakers
- are talkative, love discussion, and go into lengthy descriptions.

From this list I decided to focus on description used by students, and words and phrases that they used, or acquired from my teaching.

Description

Auditory learners love discussion, and can readily be overheard by teachers in a classroom situation, describing mathematical relationships and thereby

indicating the developing state of their insight and understanding of the topic being studied.

Examples of description include the following quotes from my students:

- “minus minus 4 is taking away a drop of 4 which is adding 4” (Negative numbers)
- “This event occurs $\frac{2}{5}$ of $\frac{3}{4}$ of the time” (Probability tree branches)
- “ $4n - 3$ is the four times table minus 3” (Linear sequences)

Auditory students can clearly hear the answer ringing out at them in particular instances, such as in the factorisation of $3pqr + 15pq$. When asked, “what multiplies with the common factor $3pq$ to give $3pqr$ ”, the answer is audibly “ r ”.

One student confidently answered that the value of the 6 in 4631 was six hundreds, reasoning with great confidence that, “you say it, you say four thousand six hundred and thirty-one.”

Phrases

Phrases are used to facilitate the application of mathematical techniques. I use many phrases in my classroom practise, and encourage students to adopt them. “State, Substitute, Solve” is a favourite, used in the application of formulæ. The alliteration helps the Auditory Learner, who notices the auditory pattern. Other phrases include,

- “Choose your ‘live’ sides” (in basic Trigonometry I explain that a side is ‘live’ if we are given its magnitude or required to find it. Once chosen, they determine the ratio needed for the problem)
- “Check your interval length” (must be 1cm if rounding to nearest 1cm).

Mnemonics

A particular example of the phrase is the mnemonic. Students begin to acquire their own personalised set of mnemonics from an early age. I find that auditory

learners are attracted to composing their own mnemonics. They enjoy the rhythmic patterns of the rhyme or saying, and benefit by additional ease of recall of a mnemonic that was self-composed.

Examples from my classes include,

“How I Love a Funky Armadillo in Mexico” (Pi to seven decimal places, obtained by counting the letters in the words. Proficiency with spelling is required).

Also,

“Sin on Holiday Cos A Healthy Tan Often Appears” (a trigonometric ratios mnemonic that I find has extra strength due to ‘sin’, ‘cos’ and ‘tan’ being used directly in the rhyme).

One student never tired of proudly reciting this mnemonic from his primary school days,

“I ate and I ate until I was sick on the floor, 64” ($8 \times 8 = 64$)

Finally here,

“Powers are more powerful than adding” was a student invention used to obtain the correct answer to 2^5 , using wordplay as the aide-memoire.

Alongside these personalised mnemonics, the Auditory Learner can compose their own raps on mathematical topics, and fall back upon a host of traditional maths-specific mnemonics and rhymes.

Words

Individual words can be emphasised to aid the Auditory Learner. For example, when dealing with Highest Common Factors, invite Auditory Learners to focus on the noun ‘factor’ and its meaning first, rather than the adjective ‘highest’. Similarly with Lowest Common Multiple, ask them to think ‘multiple’ as opposed to ‘lowest’.

In Bearings questions, emphasise that the crucial word in the question is the word ‘from’ (find the bearing of A from B). Pointing out the association of the

word 'cumulative' with that of 'accumulate' can be appreciated by the auditory student tackling the notion of Cumulative Frequency. Learning by listening is the key here. The Difference of Two Squares is literally as the title describes it to be, one square number subtracted from another.

As a teacher, one of the most valued words I use is the word 'complex'. I substitute it when I find myself reaching into my vocabulary for words such as 'complicated', 'difficult' or 'hard'. The strength of the word 'complex' is that it describes that there are certain intricate sections to the work, yet does not automatically relay the expectation to the student that you think they will have to struggle.

Conclusion

This article has been an attempt to shine a light on the students who learn by listening to words and phrases; those who search through, and wrestle with, language in order for the new concept to 'click' in their mind, and for it to be retained over a period of time. My aim of giving auditory skills a focus over the last year has made me take greater notice of those students to whom spoken language is the preferred learning style, helping them understand a concept more readily than would a visual or kinæsthetic approach. Auditory Learning is embedded in the classroom because language is used as a conduit by teacher and student alike. My experience has been catching myself overlooking the use of auditory skills in favour of more immediate visual and kinæsthetic ones; this case study has helped highlight that there are some students whose best recourse to understanding is by use of words, phrases and descriptive passages that empower their learning.

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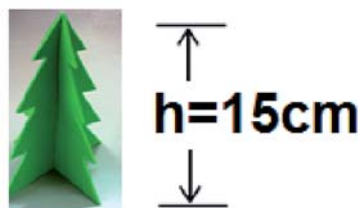
References

- 1 Hardy, G. (2008), A Creativity Taxonomy, *MT211*, November, 4
- 2 New Oceans NLP For Life Diploma Course Pack (2006)

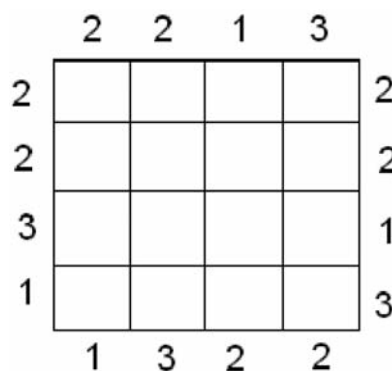
Let's plant trees!

Alzira C. M. Stein-Barana and Deisy P. Munhoz explore tree planting in a mathematical way.

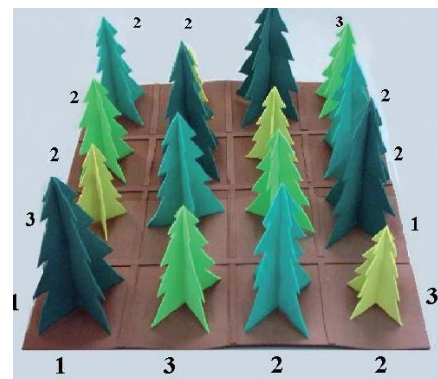
Planting trees is good in order to take care of our environment and preserve forests that we all know. What we will do is explore this activity in a mathematical way and use children's hands-on experiences to develop an understanding of minor and major mathematical concepts based on their manipulations of concrete objects in the classroom. A grove is planted using trees of different heights placed over a square grid.



We'll use four tree sets of four different heights (20cm, 17cm, 15cm, and 12cm) and a 4×4 square grid manufactured with EVA ethyl-vinyl-acetate sheets. The square grid represents the ground.



The challenge is to plant the trees organized according to guidelines previously established. The picture shows an example of the already planted grove.



Guidelines

- Take the base, which is divided into 16 squares (4×4) and, outside it, write a number from 1 to 4 next to each border square to indicate the number of trees you will have to see when looking in that particular direction.
- In every row and every column you cannot repeat trees of the same size, so that we always have one tree of each size. The challenge is to fill the entire board according to the instructions.

The teacher should make cards with instructions such as the one above to the left, so that students can plant their groves according to the established rule set and compare the trees' heights. The grove-planting math puzzle can be explored in several different combinations and difficulty levels.

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